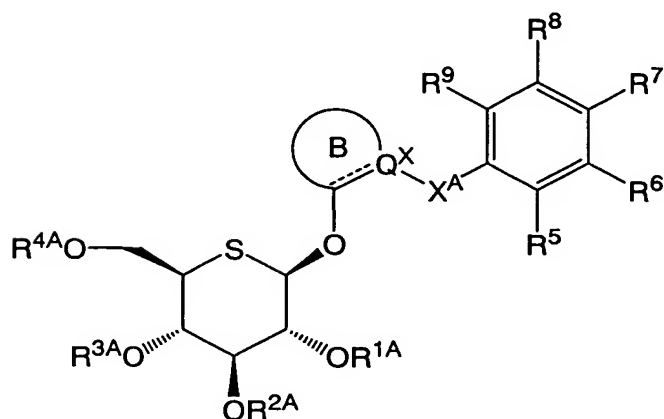


# CLAIMS

1. A 5-thio- $\beta$ -D-glucopyranoside compound of the following formula or a pharmaceutically acceptable salt thereof or a hydrate thereof:



[wherein

- B represents a heteroaryl group which may be substituted with any substituent,
- 10  $R^{1A}$ ,  $R^{2A}$ ,  $R^{3A}$  and  $R^{4A}$ , which may be the same or different, each represent a hydrogen atom, a  $C_{2-10}$  acyl group, a  $C_{7-10}$  aralkyl group, a  $C_{2-6}$  alkoxy carbonyl group, a  $C_{1-6}$  alkoxy- $C_{2-10}$  acyl group or a  $C_{1-6}$  alkoxy- $C_{2-6}$  alkoxy carbonyl group,
- 15  $Q^X$  represents N or C,
- $X^A$  represents  $-(CH_2)_n-$ ,  $-CO(CH_2)_n-$ ,  $-C(OH)(CH_2)_n-$ ,  $-O-(CH_2)_n-$ ,  $-CONH(CH_2)_n-$ ,  $-NHCO(CH_2)_n-$  (wherein n is an integer of 0 to 3),  $-COCH=CH-$ ,  $-S-$  or  $-NH-$ , provided that when  $Q^X$  is N,  $X^A$  represents  $-(CH_2)_n-$ ,  $-CO(CH_2)_n-$ ,  $-C(OH)(CH_2)_n-$ ,  $-CONH(CH_2)_n-$  (wherein n is an integer of 0 to 3)
- 20

or -COCH=CH-, and

R<sup>5</sup>, R<sup>6</sup>, R<sup>7</sup>, R<sup>8</sup> and R<sup>9</sup>, which may be the same or different, each represent:

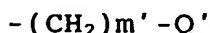
a hydrogen atom;

5 a halogen atom;

a hydroxyl group;

a C<sub>1-6</sub> alkyl group which may be substituted with one or more substituents selected from the group consisting of a halogen atom and a hydroxyl group;

10 a group represented by the formula:



{wherein m' represents an integer of 0 to 4, and Q'

represents a formyl group, an amino group, a nitro group, a cyano group, a carboxyl group, a sulfonic acid group, an

15 optionally halogen-substituted C<sub>1-6</sub> alkoxy group, a C<sub>1-6</sub>

alkoxy-C<sub>1-6</sub> alkoxy group, a C<sub>2-10</sub> acyloxy group, a C<sub>2-10</sub> acyl

group, a C<sub>2-6</sub> alkoxycarbonyl group, a C<sub>1-6</sub> alkylthio group, a

C<sub>1-6</sub> alkylsulfinyl group, a C<sub>1-6</sub> alkylsulfonyl group, -

NHC(=O)H, a C<sub>2-10</sub> acylamino group, a C<sub>1-6</sub> alkylsulfonylamino

20 group, a C<sub>1-6</sub> alkylamino group, an N,N-di(C<sub>1-6</sub> alkyl)amino

group, a carbamoyl group, an N-(C<sub>1-6</sub> alkyl)aminocarbonyl

group, or an N,N-di(C<sub>1-6</sub> alkyl)aminocarbonyl group}; or

a C<sub>3-7</sub> cycloalkyl group, a C<sub>3-7</sub> cycloalkyloxy group, an

aryl group, a C<sub>7-10</sub> aralkyl group, an aryloxy group, a C<sub>7-10</sub>

25 aralkyloxy group, a C<sub>7-10</sub> aralkylamino group, a heteroaryl

group, or a 4- to 6-membered heterocycloalkyl group,

provided that each of these groups may be substituted with

1 to 4 substituents selected from the group consisting of a

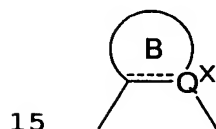
halogen atom, a hydroxyl group, a C<sub>1-6</sub> alkyl group and a C<sub>1-6</sub> alkoxy group].

2. The compound according to claim 1, wherein X<sup>A</sup> is -(CH<sub>2</sub>)<sub>n</sub>- or -CO(CH<sub>2</sub>)<sub>n</sub>- (wherein n is an integer of 0 to 3), or a pharmaceutically acceptable salt thereof or a hydrate thereof.

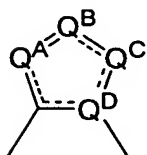
3. The compound according to claim 1, wherein X<sup>A</sup> is -CH<sub>2</sub>- or -CO-, or a pharmaceutically acceptable salt thereof or a hydrate thereof.

4. The compound according to claim 1, wherein X<sup>A</sup> is -CH<sub>2</sub>-, or a pharmaceutically acceptable salt thereof or a hydrate thereof.

5. The compound according to any one of claims 1 to 4, wherein the moiety represented by the formula:



is a group represented by the formula:

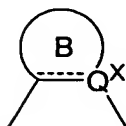


[wherein at least one of Q<sup>A</sup> to Q<sup>D</sup> represents a nitrogen atom, and the other each independently represent -C-Z<sup>X</sup>, provided that when Q<sup>D</sup> is C, any one of the ring nitrogen atoms may be substituted with Z<sup>X</sup>

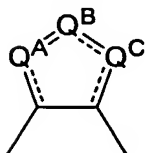
(wherein Z<sup>X</sup> represents an optionally halogen-substituted C<sub>1-6</sub> alkyl group; an optionally halogen-substituted C<sub>3-7</sub> cycloalkyl group; a C<sub>2-10</sub> acyl group; a C<sub>2-6</sub> alkoxy carbonyl

group; a phenyl or C<sub>7-10</sub> aralkyl group which may be substituted with one or more substituents selected from the group consisting of a halogen atom, a C<sub>1-6</sub> alkyl group, a C<sub>1-6</sub> alkoxy group, an amino group, a nitro group, a cyano group, a carboxyl group, a C<sub>2-10</sub> acyl group, a C<sub>2-6</sub> alkoxycarbonyl group, a C<sub>1-6</sub> alkylthio group, a C<sub>1-6</sub> alkylsulfinyl group, a C<sub>1-6</sub> alkylsulfonyl group, a C<sub>2-10</sub> acylamino group, a C<sub>1-6</sub> alkylamino group, an N,N-di(C<sub>1-6</sub> alkyl)amino group, an N-(C<sub>1-6</sub> alkyl)aminocarbonyl group and an N,N-di(C<sub>1-6</sub> alkyl)aminocarbonyl group; a pyridyl group; a thienyl group; a furanyl group; or pyrimidinyl group, and Z<sup>y</sup> independently represents a hydrogen atom; a halogen atom; a C<sub>1-6</sub> alkyl group which may be substituted with one or more substituents selected from the group consisting of a halogen atom, a hydroxyl group and a C<sub>1-6</sub> alkoxy group; an optionally halogen-substituted C<sub>3-7</sub> cycloalkyl group; a carboxyl group; or a C<sub>2-6</sub> alkoxycarbonyl group)], or a pharmaceutically acceptable salt thereof or a hydrate thereof.

6. The compound according to any one of claims 1 to 4, wherein the moiety represented by the formula:



is a pyrazole group represented by the formula:

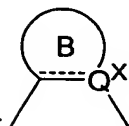


[wherein when  $Q^A$  is N and  $Q^B$  is  $-N-Z^1$  or when  $Q^A$  is  $-N-Z^2$  and  $Q^B$  is N,  $Q^C$  represents  $-C-Z^3$ , or alternatively, when  $Q^B$  is N and  $Q^C$  is  $-N-Z^4$  or when  $Q^B$  is  $-N-Z^5$  and  $Q^C$  is N,  $Q^A$  represents  $-C-Z^6$

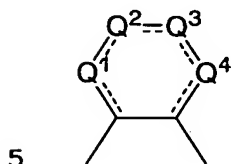
5 (wherein  $Z^1$ ,  $Z^2$ ,  $Z^4$  and  $Z^5$  each independently represent a hydrogen atom; an optionally halogen-substituted  $C_{1-6}$  alkyl group; an optionally halogen-substituted  $C_{3-7}$  cycloalkyl group; a  $C_{2-10}$  acyl group; a  $C_{2-6}$  alkoxy carbonyl group; a phenyl or  $C_{7-10}$  aralkyl group which may be substituted with  
10 one or more substituents selected from the group consisting of a halogen atom, a  $C_{1-6}$  alkyl group, a  $C_{1-6}$  alkoxy group, an amino group, a nitro group, a cyano group, a carboxyl group, a  $C_{2-10}$  acyl group, a  $C_{2-6}$  alkoxy carbonyl group, a  $C_{1-6}$  alkylthio group, a  $C_{1-6}$  alkylsulfinyl group, a  $C_{1-6}$   
15 alkylsulfonyl group, a  $C_{2-10}$  acylamino group, a  $C_{1-6}$  alkylamino group, an N,N-di( $C_{1-6}$  alkyl)amino group, an N-( $C_{1-6}$  alkyl)aminocarbonyl group and an N,N-di( $C_{1-6}$  alkyl)aminocarbonyl group; a pyridyl group; a thienyl group; a furanyl group; or a pyrimidinyl group, and  $Z^3$  and  
20  $Z^6$  each independently represent a hydrogen atom; a halogen atom; a  $C_{1-6}$  alkyl group which may be substituted with one or more substituents selected from the group consisting of a halogen atom, a hydroxyl group and a  $C_{1-6}$  alkoxy group; an optionally halogen-substituted  $C_{3-7}$  cycloalkyl group; a  
25 carboxyl group; or a  $C_{2-6}$  alkoxy carbonyl group)], or a pharmaceutically acceptable salt thereof or a hydrate thereof.

7. The compound according to any one of claims 1 to 4,

wherein the moiety represented by the formula:

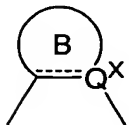


is a pyridyl group represented by the formula:

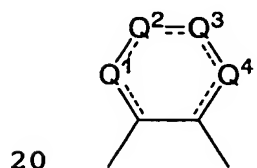


[wherein any one of  $Q^1$  to  $Q^4$  represents N and the other each independently represent  $-C-Z^7$  (wherein  $Z^7$  represents a hydrogen atom, a halogen atom, an optionally halogen-substituted  $C_{1-6}$  alkyl group, a  $C_{1-6}$  alkoxy group, an amino group, a  $C_{1-6}$  alkylamino group, an N,N-di( $C_{1-6}$  alkyl)amino group, a  $C_{2-10}$  acylamino group, a  $C_{2-10}$  acyl group or an optionally halogen-substituted  $C_{3-7}$  cycloalkyl group)], or a pharmaceutically acceptable salt thereof or a hydrate thereof.

15 8. The compound according to any one of claims 1 to 4, wherein the moiety represented by the formula:

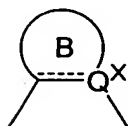


is a pyrimidyl group represented by the formula:

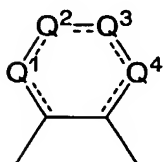


[wherein when  $Q^1$  and  $Q^3$  are each N,  $Q^2$  and  $Q^4$  each independently represent  $-C-Z^8$ , or alternatively, when  $Q^2$  and  $Q^4$  are each N,  $Q^1$  and  $Q^3$  each independently represent  $-C-Z^9$  (wherein  $Z^8$  and  $Z^9$  each independently represent a hydrogen atom, a halogen atom, an optionally halogen-substituted  $C_{1-6}$  alkyl group, a  $C_{1-6}$  alkoxy group, an amino group, a  $C_{1-6}$  alkylamino group, an N,N-di( $C_{1-6}$  alkyl)amino group, a  $C_{2-10}$  acylamino group, a  $C_{2-10}$  acyl group or an optionally halogen-substituted  $C_{3-7}$  cycloalkyl group)], or a pharmaceutically acceptable salt thereof or a hydrate thereof.

9. The compound according to any one of claims 1 to 4, wherein the moiety represented by the formula:



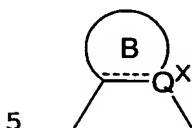
15 is a pyridazinyl group represented by the formula:



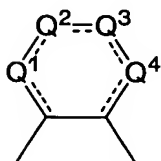
[wherein  $Q^1$  and  $Q^2$ ,  $Q^2$  and  $Q^3$ , or  $Q^3$  and  $Q^4$  each represent N, and the other each represent  $-C-Z^{10}$  (wherein  $Z^{10}$  independently represents a hydrogen atom, a halogen atom, an optionally halogen-substituted  $C_{1-6}$  alkyl group, a  $C_{1-6}$  alkoxy group, an amino group, a  $C_{1-6}$  alkylamino group, an N,N-di( $C_{1-6}$  alkyl)amino group, a  $C_{2-10}$  acylamino group, a  $C_{2-10}$  acyl group or an optionally halogen-substituted  $C_{3-7}$

cycloalkyl group)], or a pharmaceutically acceptable salt thereof or a hydrate thereof.

10. The compound according to any one of claims 1 to 4, wherein the moiety represented by the formula:

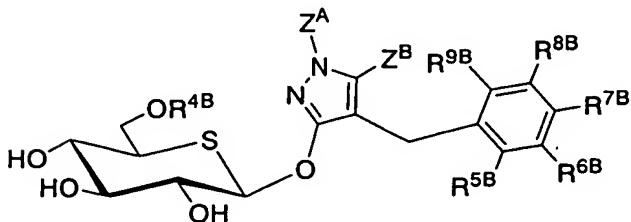


is a pyrazinyl group represented by the formula:



[wherein  $Q^1$  and  $Q^4$  each represent N and the other each represent  $-C-Z^{11}$  (wherein  $Z^{11}$  independently represents a hydrogen atom, a halogen atom, an optionally halogen-substituted  $C_{1-6}$  alkyl group, an amino group, a  $C_{1-6}$  alkoxy group, a  $C_{1-6}$  alkylamino group, an N,N-di( $C_{1-6}$  alkyl)amino group, a  $C_{2-10}$  acylamino group, a  $C_{2-10}$  acyl group or an optionally halogen-substituted  $C_{3-7}$  cycloalkyl group)], or a pharmaceutically acceptable salt thereof or a hydrate thereof.

11. A 5-thio- $\beta$ -D-glucopyranoside compound of the following formula or a pharmaceutically acceptable salt thereof:





(wherein  $Z^A$  represents a hydrogen atom, a  $C_{1-6}$  alkyl group, a halogen-substituted  $C_{1-6}$  alkyl group, a  $C_{3-6}$  cycloalkyl group, a benzyl group, a  $C_{2-10}$  acyl group or a  $C_{2-6}$  alkoxy carbonyl group,  $Z^B$  represents a  $C_{1-6}$  alkyl group or a halogen-substituted  $C_{1-6}$  alkyl group,  $R^{5B}$  to  $R^{9B}$ , which may be the same or different, each represent a hydrogen atom, a halogen atom, a  $C_{1-6}$  alkyl group, a halogen-substituted  $C_{1-6}$  alkyl group, a  $C_{3-6}$  cycloalkyl group, a  $C_{1-6}$  alkoxy group, a halogen-substituted  $C_{1-6}$  alkoxy group or a  $C_{1-6}$  alkylthio group, and  $R^{4B}$  represents a hydrogen atom, a  $C_{2-10}$  acyl group or a  $C_{2-6}$  alkoxy carbonyl group).

12. A pharmaceutical preparation, which comprises the 5-thio- $\beta$ -D-glucopyranoside compound according to any one of claims 1 to 11 or a pharmaceutically acceptable salt thereof or a hydrate thereof as an active ingredient.

13. The pharmaceutical preparation according to claim 12, which is an inhibitor of sodium-dependent glucose transporter 2 activity.

14. The pharmaceutical preparation according to claim 13, which is a prophylactic or therapeutic agent for diabetes, diabetes-related diseases or diabetic complications.

15. A pharmaceutical preparation, which comprises the 5-thio- $\beta$ -D-glucopyranoside compound according to any one of claims 1 to 11 or a pharmaceutically acceptable salt thereof or a hydrate thereof, in combination with at least one drug selected from the group consisting of an insulin sensitizer selected from the group consisting of a  $PPAR_\gamma$  agonist; a  $PPAR_{\alpha/\gamma}$  agonist; a  $PPAR_\delta$  agonist; and a  $PPAR_{\alpha/\gamma/\delta}$

agonist, a glycosidase inhibitor, a biguanide, an insulin secretagogue, an insulin formulation and a dipeptidyl peptidase IV inhibitor.

16. A pharmaceutical preparation, which comprises the
- 5 5-thio- $\beta$ -D-glucopyranoside compound according to any one of claims 1 to 11 or a pharmaceutically acceptable salt thereof or a hydrate thereof, in combination with at least one drug selected from the group consisting of a
- hydroxymethylglutaryl coenzyme A reductase inhibitor, a
- 10 fibrate, a squalene synthase inhibitor, an acyl-coenzyme A:cholesterol acyltransferase inhibitor, a low-density lipoprotein receptor promoter, a microsomal triglyceride transfer protein inhibitor and an anorectic.